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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,580	01/22/2002	Jin-Yuan Lee	085027-0060	6089

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EXAMINER	
MITCHELL, JAMES M	

ART UNIT	PAPER NUMBER
2813	

NOTIFICATION DATE	DELIVERY MODE
01/26/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

SIP_Docket@mwe.com

Office Action Summary	Application No.	Applicant(s)	
	10/055,580	LEE ET AL.	
	Examiner	Art Unit	
	JAMES M. MITCHELL	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 November 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *See Continuation Sheet* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *92,97,99,101,104,106-109,118,120-123,125-129,151,152,154 and 156-165* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims pending in the application are 92,97,99,101,104,106-109,118,120-123,125-129,151,152,154 and 156-165.

DETAILED ACTION

1. This office action is in response to applicant's amendment filed February 25, 2009.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 92, 97, 101, 104, 106, 107, 109, 118, 120-123, 126-129 and 163 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) in combination with Wu et al. (U.S. 6,459,150) and Ohuchi (U.S. 2002/0033525).

5. Morrell (e.g. Fig. 3, 4) discloses:

(cl. 92, 120) A substrate (14) comprising a first pad (32) having a surface with a first (e.g. left portion), second (e.g. right portion) and third region (e.g. center) between the

first and second regions, and a bonding structure on a chip (12) comprising a pad (16) having a top surface (e.g. plane mechanically contacting 50) with a fourth region (e.g. left portion, 16, under 46), a fifth region (e.g. right portion, 16, under 46), and a sixth region between said fourth and fifth (e.g. center portion contacting 20) and over the pad, and a passivation layer (46) on (e.g. covering) said fourth and fifth regions, a metal layer (50) on said third region, over (e.g. above) said passivation layer and over said fourth and fifth regions; a copper pillar (24; Col. 2, Line 16-19) on said metal layer, over said passivation and over said fourth and fifth regions, wherein said sixth region is at a top of a second opening in the pasivation layer (e.g. opening in said passivation exposes said sixth region); a copper pillar (24) between sixth region and said first pad, wherein said copper pillar is connected to said sixth region through said second opening and to said first pad, said metal metal layer (50) is between copper (24) and said sixth region (opening in 46 exposing pad, 16) between copper pillar and said passivation , between said copper and said first region and between said copper and said second region (Fig. 3), wherein said pillar is connected through said metal layer, a tin containing cap/layer (30; Col. 3, Lines 51-53 & 65-66) over said copper pillar; said copper pillar has a thickness[1] (e.g. top to bottom of 24) greater than a distance between said copper pillar[2] and said third region (e.g. left to right greater than top of 34 to bottom 3; Fig. 2);

[1] Alternatively could be from left to right.
[2] No definite location along pillar given as staring point to measure distance from.

(cl. 101) with a conductive layer (162) between the cap and copper pillar wherein vertical thickness of pillar (e.g. vertical from top to bottom) greater than a thickness of the conductive layer (e.g. top to bottom) ;

(cl. 104) the tin cap has a melting point less than copper (e.g. its solder)

(cl. 106, 123) the metal layer comprises titanium (Col. 3, Lines 1-8);

(cl. 107, 127) metal layer comprises titanium-tungsten (col. 3, Lines 1-5);

(cl. 109, 128) where metal layer comprise copper (Col. 3, Lines 1-5);

(cl. 118, 121) wherein tin is directly on said copper pillar (28 on 24);

(cl. 121) said tin cap is directly on said copper pillar (Fig. 3);

(cl. 126) a conductive layer (162) between said copper pillar and tin cap (e.g. 130) wherein a second vertical thickness is greater than a third vertical thickness of the conductive layer;

(cl. 129) the tin cap has a melting point less than that of said copper pillar (Col. 4, Lines 4, Lines 1-3).

6. Morrell does not appear to show explicit use of a solder mask or that it tin cap comprised silver or copper.

7. However, Wu teaches use of a solder mask (86).

8. It would have been obvious to one of ordinary skill in the art to modify the substrate of Morrell to include a mask in order to protect the substrate an insulate pads as taught by Wu (Col. 8, Lines 43-45).

9. With respect to the cap, Morrell discloses the same invention as claimed except that its tin cap comprises lead instead of silver or copper. Ohuchi (Par. 0044) shows

that Sn/Pb and Sn/ Ag produce equivalent structures known in the art. Therefore, because these materials are art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute Sn/Ag for Sn/Pb.

10. Furthermore, Sn/ Ag is a known material for providing eutectic solders as exemplified by Ohuchi (Par. 0044). As such, it would have been obvious to one of ordinary skill in the art to select Sn/Ag as an alternate eutectic solder, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

11. With respect to claim 122 that the cap has a thickness across axis of the body and therefore a traverse dimension less than that of the copper pillar and various selected thicknesses/ dimensions of other claims, applicant has not disclosed that the selected dimension is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical. As such, the selected dimension would have been obvious to one of ordinary skill in the art, since it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

12. With respect to the process limitation of claims 97 and 163 that the copper is electroplated, the prior art forms the same structure as claimed. Although Morrell discloses plating of its pillar (Col. 3, Lines 24-26), claim 163 is a product-by-process therefore patentability does not depend on its process. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

13. Claims 99 and 165 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571), Wu et al. (U.S. 6,459,150) and Ohuchi (U.S. 2002/0033525) as applied to claims 92 and 120 and further in combination with Hozoji et al. (U.S. 2002/0079575).

14. Neither Morrell nor Ohuchi appear to disclose it solder material being tin comprising copper.

15. However, Hozoji teaches use of bumps of tin comprising copper to mount chips (Par. 0104).

16. TiN comprising copper is a known material for connecting chips as exemplified above. As such, its selection would have been obvious to one of ordinary skill in the art, since it has been held that the selection of a known material based on its suitability for

its intended use supported a prima facie obviousness determination. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

17. Claims 108 and 125 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571), Wu et al. (U.S. 6,459,150) and Ohuchi (U.S. 2002/0033525) as applied to claims 92 and 120 and further in combination with Fang (U.S. 2002/0095784).

18. Neither Morrell nor Ohuchi disclose that its metal layer is chromium.

19. Fang teaches use of chromium metal layer ("UBM"; 308; Par .0029).

20. Because use of chromium is known in the art for providing underlying metal layers, it would have been obvious to one ordinary skill in the art to select the claimed material, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

21. Claims 151, 152, 154, 157, 159-162 and 164 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571).

22. Morrell (e.g. Fig. 3, 4) discloses elements from paragraph 5 of this office action including:

(cl. 151) A bonding structure on a chip comprising a pad (16) having a top surface (e.g. plane mechanically contacting 50) with an alternate first region[3] (e.g. left portion, 16, under 46), an alternate second region (e.g. right portion, 16, under 46), and alternate third region between said first and second regions (e.g. center portion contacting 20), and a passivation layer (46) on (e.g. covering) said first and second regions, wherein an opening in said passivation layer is over said third region and exposes said third region: a metal layer (50) on said third region, over (e.g. above) said passivation layer and over said first and second regions; a copper pillar (24; Col. 2, Line 16-19) on said metal layer, over said passivation and over said first and second regions; over said pad; and a tin containing cap (30; Col. 3, Lines 51-53 & 65-66) over said copper pillar; said cap having a first vertical thickness less than a second vertical thickness of said copper pillar (e.g. Fig. 3);

(cl. 152) said tin cap contacts (e.g. Fig. 3);

(cl. 154) the metal layer comprises titanium (Col. 3, Lines 1-8);

(cl. 159) a conductive layer (162) between said copper pillar and tin cap (e.g. 130) wherein a second vertical thickness is greater than a third vertical thickness of the conductive layer;

(cl. 160) the metal layer comprises titanium-tungsten (Col. 3, Lines 1-8);

(cl. 157, 161) the metal layer comprise copper (Col. 3, Lines 1-8);

(cl. 162) the tin cap has a melting point less than that of said copper pillar (Col. 4, Lines 1-3).

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[3] Applicant can be his own lexicographer. Pads can be broken into however many section one wants or

23. With respect to claim 151 that the cap has a thickness across Y axis of the body and therefore a traverse dimension less than that of the copper pillar, applicant has not disclosed that the selected dimension is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical. As such, the selected dimension would have been obvious to one of ordinary skill in the art, since it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

24. With respect to the process limitation of claims 163 and164 that the copper is electroplated, the prior art forms the same structure as claimed. Although Morrell discloses plating of its pillar (Col. 3, Lines 24-26), claim 163 is a product-by-process therefore patentability does not depend on its process. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

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call them whatever name one chooses (e.g. A, B, C, 1st, 6th etc.).

25. Claim 156 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) as applied to claim 151 and further in combination with Fang (U.S. 2002/0095784).

26. Morrell does not disclose that its metal layer is chromium.

27. Fang teaches use of chromium metal layer ("UBM"; 308; Par .0029).

28. Because use of chromium is known in the art for providing underlying metal layers, it would have been obvious to one ordinary skill in the art to select the claimed material, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

29. Claim 158 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) as applied to claim 151 and further in combination with Hozoji et al. (U.S. 2002/0079575).

30. Morrell does not appear to disclose it solder material being tin comprising silver and copper.

31. However, Hozoji teaches use of bumps of tin comprising copper to mount chips (Par. 0104).

32. TiN comprising silver and copper is a known material for connecting chips as exemplified above. As such, its selection would have been obvious to one of ordinary skill in the art, since it has been held that the selection of a known material based on its

suitability for its intended use supported a prima facie obviousness determination. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

33. Claims 161 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morrell (U.S. 6,013,571) as applied to claim 151 and further in combination with Ohuchi (U.S. 2002/0033525).

34. Morrell discloses the same invention as claimed including a copper layer over Sn/Pb. This is the same as the claimed invention except that its tin cap comprises lead instead of silver.

35. Ohuchi (Par. 0044) shows that Sn/Pb and Sn/ Ag produce equivalent structures known in the art. Therefore, because these materials are art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute Sn/Ag for Sn/Pb.

36. Furthermore, Sn/ Ag is a known material for providing eutectic solders as exemplified by Ohuchi (Par. 0044). As such, it would have been obvious to one of ordinary skill in the art to select Sn/Ag as an alternate eutectic solder, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

Response to Arguments

37. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection. In an effort to expedite prosecution, examiner has addressed some limitations that may be relevant.

38. Applicant contends that his invention is patentable over the prior art, because while Morrell teaches forming its cap by electroplating there is no teaching that Ohuchi's Sn-Ag may be electroplated. Examiner is unpersuaded.

39. Applicant contends patentability, because allegedly the distance and various thickness are disclosed. Without conceding that point (addressed in office action), even if the sizes were not addressed, dimensiosns are prima facie obvious. Applicant attempts to rebut, by indicating changing size allows for smaller pitch. The resultant must be nonobvoius. As applicant is quite aware, to make things smaller (hole, pitch etc.) you need only to reduce corresponding parts. By reducing a pad size for the ability to have a smaller pitch would be the expected result; this is not nonobvoius.

40. As for applicant's allegation of the inability to use Ohuchi, as previously stated, applicant's claims are products, and it is immaterial as to the process used to make the claims. Morrell' disclosure of its process, while they may be preferences, is not the sole mean by which to accomplish the particular task.

41. Moreover, In response to applicant's argument that there is not teaching of electroplating in Ohuchi and therefore Ohuchi is nonanalogous, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re*

Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, both of the prior art are based on semiconductor and even more narrowly flip chip configurations. One looking at flip chip configurations would also look to improve what is known in the prior art.

42. Also, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Because the prior art teaches Sn-Ag as a known material for contacts, its use would have been obvious based on what was known in the art.

43. Secondly, as for Morrell's teaching of electroplating its cap, this step while maybe a preference is not limiting. Use of electroplating is a common process known in the art to apply Sn-Ag; thus, such use would be obvious as using a know method to address a known problem of applying conductive material. See Cheung (U.S 6,638,847). Cf. E.g. KSR Int'l v. Teleflex Inc., 127 S.Ct. 1727,1743, 550 U.S. _,17 (2007) (finding that when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense).

44. Lastly, applicant contends patentability, because allegedly applicant has established criticality of changing its cap size, because changing the size of its cap makes it easier to lower the chip in openings. While this may be a benefit, this is merely an expected result, not something nonobvious. It is common practice that if something is too big to enter an opening, parts may be decreased (e.g. sanded, resized etc.) in size to allow easier entry. Lack of criticality is further evidenced by applicant's own disclosure showing alternate embodiments whereby the tin cap may be the same size width/traverse as the underlying pillar (see Applicant's orig. disclosure Fig. 2F or 3E).

Conclusion

45. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES M. MITCHELL whose telephone number is (571)272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mathew Landau can be reached on (571) 272-1731. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

January 17, 2010
/James M. Mitchell/
Examiner, Art Unit 2813